

WHAT IS CLAIMED IS:

1. An I.V. flush syringe assembly comprising:

a barrel including a cylindrical sidewall having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber;

a plunger including an elongate body portion having a proximal end, a distal end and a stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel, said stopper having a distal surface; and

anti-reflux means in said barrel for controlling stopper deflection when fluid has been delivered from said chamber and said stopper is in contact with said distal wall.

2. The syringe assembly of claim 1 wherein said anti-reflux means includes an annular boss on said inside surface of said distal wall surrounding said passageway, said boss being positioned so that it contacts said distal surface of said stopper and seals said passageway before portions of said inside surface of said distal wall surrounding said boss contact said distal surface of said stopper.

3. The syringe assembly of claim 2 wherein said inside surface of said distal wall is conically shaped and said annular boss is raised from said inside surface.

4. The syringe assembly of claim 2 wherein said anti-reflux means includes said distal surface of said stopper being conically shaped and projecting toward said annular boss.

5. The syringe assembly of claim 2 further including at least one projection on said distal surface of said stopper positioned mostly in a space between said distal surface and said inside surface of said distal wall when said distal surface of said stopper first contacts said annular boss.
- 5 6. The syringe assembly of claim 1 including flush solution in said chamber.
7. The syringe assembly of claim 6 further including a tip cap releasably connected to said tip of said syringe barrel for sealing said passageway.
- 10 8. The syringe assembly of claim 6 wherein said flush solution is selected from the group consisting of saline flush solution and heparin lock flush solution.
9. The syringe assembly of claim 1 wherein said stopper is made of material
15 selected from the list consisting of thermoplastic elastomers, natural rubber, synthetic rubber, thermoplastic materials and combinations thereof.
10. The syringe assembly of claim 1 further comprising a needle assembly including a cannula having a proximal end, a distal end and a lumen
20 therethrough, and a hub having an open proximal end containing a cavity and a distal end attached to said proximal end of said cannula so that said lumen is in fluid communication with said cavity, said needle assembly being removably attached to said tip of said barrel through engagement of said tip to said cavity so that said lumen is in fluid communication with said chamber.
- 25 11. An I.V. flush syringe assembly comprising:
a barrel including a cylindrical sidewall having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway
30 therethrough in fluid communication with said chamber;

a plunger including an elongate body portion having a proximal end, a distal end and a stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body
5 portion extending outwardly from said open proximal end of said barrel, said stopper having a distal surface; and

a tip cap releasably connected to said tip of said syringe barrel for sealing said passageway;

a quantity of flush solution in said chamber between said stopper and said
10 distal wall;

anti-reflux means for controlling stopper deflection when fluid has been delivered from said chamber and said stopper is in contact with said distal wall, said anti-reflux means including an annular boss on said inside surface of said of said distal wall surrounding said passageway, said boss being positioned so that
15 it contacts said distal surface of said stopper and seals said passageway before portions of said inside surface of said distal wall surrounding said boss contact said distal surface of said stopper.

12. The syringe assembly of claim 11 further including at least one projection
20 on said distal surface of said stopper positioned mostly in a space between said distal surface and said inside surface of said distal wall when said distal surface of said stopper first contacts said annular boss.

13. A method of flushing a catheter comprising the steps of:

25 (a) providing a syringe assembly having a barrel including a cylindrical sidewall having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber, a plunger including an elongate body portion
30 having a proximal end, a distal end, and a stopper having a distal surface, said

stopper being slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel, a quantity of
5 flush solution in said chamber, and anti-reflux means in said barrel for controlling stopper deflection when said flush solution has been delivered from said chamber and said stopper is in contact with said distal wall;

(b) providing a catheter having a proximal end, a distal end and a passageway therethrough and a housing having a hollow interior connected to
10 said catheter and in fluid communication with said passageway, said housing having an access valve for allowing fluid communication with said hollow interior;

(c) placing said distal end of said catheter in a blood vessel;

(d) engaging said elongate tip of said barrel with said access valve so that said passageway of said syringe barrel is in fluid communication with said
15 hollow interior of said housing;

(e) applying force to said plunger to move said plunger in a distal direction with respect to said barrel so that said flush solution in said chamber flows through said passageway into said hollow chamber of said housing and through said passageway of said catheter;

(f) continue applying force to the plunger until said stopper contacts and presses against said distal wall of said barrel; and

(g) disengaging said elongate tip from said access valve.

14. A method of flushing a catheter comprising the steps of:

(a) providing a syringe assembly having a barrel including a cylindrical sidewall including an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber, a plunger including an elongate body portion
30 having a proximal end, a distal end, and a stopper having a distal surface, said

- stopper being slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of the stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel, a quantity of
- 5 flush solution in said chamber, a needle assembly including a cannula having a proximal end, a distal end and a lumen therethrough and a hub having an open proximal end containing a cavity and a distal end attached to said proximal end of said cannula so that said lumen is in fluid communication with said cavity, said needle assembly being attached to said tip of said barrel so that said lumen ins
- 10 in fluid communication with said chamber, and anti-reflux means in said barrel for controlling stopper deflection when said flush solution has been delivered from said chamber and said stopper is in contact with said distal wall;
- (b) providing a catheter having a proximal end, a distal end and a passageway therethrough and a housing having a hollow interior connected to
- 15 said catheter and in fluid communication with said passageway, said housing having a septum for allowing fluid communication with said hollow interior;
- (c) placing said distal end of said catheter in a blood vessel;
- (d) forcing said distal end of said cannula through said septum so that said lumen is in fluid communication with said hollow interior of said housing;
- 20 (e) applying force to said plunger to move said plunger in a distal direction with respect to said barrel so that said flush solution in said chamber flows through said passageway into said hollow chamber of said housing and through said passageway of said catheter;
- (f) continue applying force to the plunger until said stopper contacts
- 25 and presses against said distal wall of said barrel; and
- (g) withdrawing said cannula from said septum